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## **Media Parameter Downloading**

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## **MEDIA PARAMETER DOWNLOADING**

### **TECHNICAL FIELD**

The described subject matter relates to optimizing printer operations. More particularly, the described subject matter pertains to systems and procedures for an imaging device to automatically identify a print media and to download media parameters corresponding to the print media from a remote server computer.

### **BACKGROUND**

Conventional imaging devices such as printers, plotters, copiers, facsimile machines and the like, typically utilize various types of print media to print images. Such print media types include paper based media (e.g., glossy paper, semi-glossy paper, matte paper, etc.) as well as non-paper based media (e.g., vellum, film, etc.).

To optimize print quality, an imaging device generally requires a number of parameters such as print modes, color maps, and/or the like, to be configured. This is because such parameters typically vary with the type of media being utilized. For example, an ink-based imaging device such as an ink jet printer that prints to an overhead transparency (OHT) designed for a laser printer may result in a print that not only may need to re-imaged, but that also may result in gumming-up the internal assembly of the imaging device. This is because ink-based imaging devices use ink and laser-based OHTs do not generally have any ink retention coating. Accordingly, an ink-imaging device may adjust parameters such as printing speed, ink drying time, the amount of ink used, and/or the like, to suit the particular print media being used.

In yet another example, a laser-based imaging device, such as a laser printer that prints on an ink-based OHT may melt the ink-based OHT because

ink-based OHTs are not manufactured to withstand the amount of heat typically generated by a laser printer's image fusing process. As a result, the imaging job may not only need to be re-imaged, but the job may also result in the need to replace printer parts if the incompatible print media melted onto internal parts of the laser printer. Accordingly, a laser-imaging device may adjust parameters such as the speed of printing, ink-fusing temperature, biasing voltage, and/or the like, to suit the particular print media being used.

Some imaging devices need to be manually configured to properly operate based on the print media type that is going to be used. Thus, print media type information and instructions are typically written on a media box. However, many users do not read the box or the instructions that accompany the media. Once the media is removed from the box for installation into the imaging device, the box is generally thrown away along with the media type indication on the box. Thus, if the print media is removed from one printer and re-installed into a different printer, the user is often required to either remember or guess the print media's corresponding media type to properly configure the different printer.

Accordingly, a number of techniques have been developed for an imaging device to identify the particular type of print media that is loaded into an imaging device. For example, U.S. Patent No. 7,148,162 to Huston et al., assigned to the assignee hereof, and incorporated herein by reference, describes marking each sheet of print media with eight separate indicia by imprinting the markings either on the face of each media sheet or on the side of each media sheet. E.g., two (2) barcodes are printed on each margin's face or one each edge of a sheet of media, which has four (4) margins/edges —top, right, bottom

and left. These markings include a print media type indication. Sensors on the imaging device sense these markings to determine the print media type.

Another conventional technique used by an imaging device to identify print media type is described in U.S. Patent No. 7,047,110 to Smith, assigned to the assignee hereof, and incorporated herein by reference. Smith describes marking a leading edge of a roll of print media with indicia such as a bar code to indicate media type and the remaining length of media left on the roll. An imaging device reads the marked indicia to obtain the information and then cuts the leading edge of the media off before printing to it. Once a print job is complete, the imaging device readies the media for a next print job by re-printing the information onto the leading edge of the roll.

Once the imaging device has detected the media type, the imaging device attempts to map the detected media type to a set of predetermined media parameters that are hardcoded into the firmware of the imaging device. If the imaging device identifies any media parameters that correspond to the detected media type, the imaging device uses these parameters to configure its operations when printing to the print media.

Unfortunately, these conventional techniques to configure an imaging device do not address how an imaging device will respond to detecting a print media type that cannot be mapped to a predetermined static set of operating parameters that an imaging device may need to properly configure itself to print on the media type. Instead, such techniques typically assume that any required operating parameters are provided by a combination of indicia marked on the print media (e.g., a barcode that identifies a predetermined code for a media type), and predetermined operating parameters hardcoded into the imaging device's firmware that correspond to every type of print media that the

device was expected to print on. Because these parameters are hardcoded into firmware, they are unchangeable and static. Thus, if the media type is unknown and/or for some other reason cannot be mapped to such hardwired parameters, the imaging device cannot typically configure itself to  
5 appropriately print to the print media.

Accordingly, the various implementations of the following described subject matter address these and other problems of conventional techniques to provide print media parameters to printing devices.

### **SUMMARY**

10 The described arrangements and procedures provide for an imaging device to download media parameters from a remote server computer that is connected to the imaging device across a network. Specifically, the imaging device detects a media ID from print media. Responsive to detecting the media ID, the imaging device downloads a set of media parameters that correspond to  
15 the Media ID from the server computer. The imaging device uses these downloaded media parameters to automatically configure itself to form images on corresponding print media.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 shows an exemplary image forming system for downloading  
20 media parameters to an imaging device.

Fig. 2 shows further aspects of an exemplary imaging device of Fig. 1 for downloading media parameters from a remote server computer. In particular, Fig. 2 illustrates further hardware and software aspects of the imaging device.

Fig. 3 shows further aspects of an exemplary remote media parameter server computer of Fig. 1 for downloading media parameters to an imaging device. In particular, Fig. 3 illustrates further hardware and software aspects of the remote server.

5            Fig. 4 shows an exemplary procedure to download media parameters to an imaging device.

Fig. 5 shows further aspects of the exemplary procedure of Fig. 4 to download media parameters to an imaging device.

### **DETAILED DESCRIPTION**

10            The following description sets forth a specific configuration of a system and procedure that incorporates elements recited in the appended claims. The embodiment is described with specificity to meet statutory requirements. However, the description itself is not intended to limit the scope of this patent. Rather, the inventors have contemplated that the claimed subject matter might  
15            also be implemented in other ways, to include different elements or combinations of elements similar to the ones described in this document, in conjunction with other present or future technologies.

#### **Overview**

20            The described arrangements and procedures to download print media parameters corresponding to a detected media ID from a server computer provide a number of benefits as compared to conventional techniques that hardcode media parameters onto the firmware of an imaging device or encode such parameters onto stamped indicia on the print media itself. For example, an imaging device, significantly, is now able to determine a proper set of media  
25            parameters to configure itself to print to otherwise unanticipated print media. Additionally, data that is imprinted on print media, which generally include

operating parameters for specific printer models and types of print media, are substantially simplified in that they only need to provide a substantially unique identifier (e.g., an ISBN number that identifies a book) with respect to the print media. Furthermore, an imaging device's firmware no longer needs to  
5 hardcode all of the potential operating parameters for every possible type of print media that may be loaded in the device.

### **An Exemplary Image Forming System**

Fig. 1 shows a system 100 for downloading media parameters, which includes an image-forming device 112, a computer 112, and a communication  
10 medium 114 operatively coupling the imaging device to the computer. Exemplary image forming devices include, for example, a printer, such as a laser printer, inkjet printer, a dot matrix printer, a dry medium printer, a plotter, a multiple function peripheral device, a copier, a facsimile machine, and so on.

The image-forming device is configured to form images upon print  
15 media 116. Print media may be in a number of different forms such as a stack (or ream) of print media, folded print media, rolled print media, etc. Print media includes, for example, paper, envelopes, transparencies, labels, and the like. In this configuration, the print media is loaded into the imaging device 110 using one or more media supply bins 122.

20 The computer 112 is implemented as a personal computer (PC), server, a Web Server, or other device configured to communicate with the image device 112 over the communication medium. The computer includes an optional display 118 such as a CRT or flat-panel monitor to display information to a user. The computer also includes a number of optional input devices such  
25 as a keyboard 120-1 and a mouse 120-2.

An exemplary communication medium 114 includes a parallel connection, packet switched network, such as an the Internet, a Local Area Network (LAN), an organizational intranet, and/or other communication configurations operable to provide electronic exchange of information between the host device 110 and the image forming device 112 using an appropriate protocol. Other image forming system arrangements are possible including additional computers 112 and/or additional image forming devices 110 coupled with the communication medium.

When used in a LAN networking environment, the imaging device 110 and remote computer 112 are connected to LAN 114 via network interface or adapter (individual network interface and/or adapters are not shown). When used in a Wide Area Network (WAN) 114 such as the Internet, the imaging device and computer include respective modems (not shown) or other means for establishing communications with one another over the WAN.

Fig. 2 shows further aspects of the exemplary imaging device 110 of Fig. 1 for downloading media parameters. In particular, Fig. 2 illustrates further hardware and software aspects of the imaging device. The imaging device includes a processor 210 that is coupled to memory 212. The memory includes any combination of volatile and non-volatile computer-readable media for reading and writing. Volatile computer-readable media includes, for example, random access memory (RAM). Non-volatile computer-readable media includes, for example, read only memory (ROM), magnetic media such as a hard-disk, an optical disk drive, a floppy diskette, a flash memory card, a CD-ROM, and/or the like.

The processor 210 is configured to fetch and execute computer program instructions from application programs 214 such as an operating system, a

network communication module 216, a media type detection module 220, a look-up-table (LUT) management module 220, and an imaging device configuration module 222. The processor is also configured to fetch and store information from/to data 224 such as from/to a LUT 226, and the like, while  
5 executing the application programs.

The communication module 216 is configured to use appropriate network protocols to send messages 232 and receive messages 234 across the network 114 of Fig. 1 to/from the remote server computer 112. In particular, the communication module generates, communicates, and receives any one or  
10 more of the following types of data/messages: Web pages, electronic mail (e-mail), and/or other types of data packets such as Transmission Control Protocol (TCP)/Internet Protocol (IP)/User Datagram Protocol (UDP) data packets.

To send and receive Web pages, the communication module 216 includes an embedded Web server (EWS) that serves, or communicates a Web  
15 page to an Internet Protocol (IP) address or a Universal Resource Locator (URL) that substantially uniquely identifies the remote computer 112 of Fig. 1 across the network 114. The EWS uses an appropriate network transfer protocol such as the Hypertext Transfer Protocol (HTTP) to both serve Web page documents to the remote computer, and to receive Web page documents  
20 from the remote computer. URL's can also specify a URL of a File Transfer Protocol Server (FTP) server to download a specified data file such as a portion of a remote LUT that maps a media ID to media parameters.

To send and receive e-mail, the communication module 216 includes an electronic mail client that supports standard e-mail protocols such as Simple  
25 Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP),

and/or Post Office Protocol (POP). (Techniques to send and receive e-mail messages are well known in the communication arts).

The media detection module 218 detects a media ID (e.g., see, media ID 124 of Fig. 1) from print media that is loaded in one or more media supply bins (e.g., see media supply bin 122 of Fig. 1) of the imaging device 110. The media ID does not need to encode any particular operating parameters for specific printer models or types. Rather, the media indication is any substantially unique identifier used to substantially uniquely identify the media as compared to other media with different media parameters such as a different type, size, composition, and/or the like.

A number of different procedures can be used to identify a media ID, or type that corresponds to media that is loaded into an imaging device. For example, one procedure requires that each sheet of print media in a stack of print media or the leading edge of a roll to be imprinted with a number of indicia that can be sensed by an imaging device such as imaging device 110. To detect such imprinted indicia, the imaging device includes a number of sensors (e.g., optical sensors, which are not shown) to read the imprinted indicia. An exemplary image forming device having such sensors is described in greater detail in reference to U.S. Patent Application No. \_\_\_\_\_, to Haines et al., titled "Image Forming Devices and Methods of Forming Hard Images", which was filed on \_\_\_\_\_, and herein incorporated by reference.

In another example, active print media packaging is used to automatically provide an imaging device with an indication of the print media that is loaded into the device. An active package of print media (e.g., ream or a roll of print media) has an electronic tag (e.g., a radio frequency identification

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tag) either fixed to the package itself, or fixed to a single top or bottom sheet in a ream of print media. The electronic tag is designed to store print media information. When the packaging and/or the print media are loaded into a supply bin of the imaging device, the imaging device signals the electronic tag to acquire information stored on the tag. Aspects of active packaging are described in greater detail in U.S. Patent Application No. \_\_\_\_\_, to Haines et al., titled "Active Packaging Providing Print Media Information", which was filed on \_\_\_\_\_, and herein incorporated by reference.

The detection module 218 detects the media indication such as media indication 124 of Fig. 1 using any of above described techniques or other procedures. Responsive to detecting the media type indication from the print media, the LUT management module 220 uses the detected indication to determine if media parameters and/or other information that corresponds to the detected media type are stored in the LUT 226. Such a determination can be based on a number of criteria in addition to the detected media ID, such as the specific model of the imaging device 110, the particular imaging software or software version that is being used, how the print media is packaged (e.g., in a ream or a roll), and/or the like.

A LUT 226 includes one or more media identifiers 228 to media parameter 230 mappings, which can be used by the device to match the detected media ID to a corresponding set of media parameters. In one configuration, The LUT management module 220 stores one or more "most recently used" media type ID 228 to media parameter 230 mappings in the LUT. The number of mappings in the most recently used table can be user configurable or based on some arbitrary criteria such as an amount of memory 214 that is available at any moment in time to store the table.

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The LUT 226 is optional because the imaging device can also download an appropriate set of media parameters that map to the detected media ID from the remote computer 112 of Fig. 1. To illustrate this, consider that in one configuration, if the LUT management module 220 does not identify a set of media parameters that correspond to the detected media ID in the LUT (e.g., because the media type or media ID is new or changed, and/or otherwise not mapped to parameters in the table), the management module downloads a set of media parameters that map to the detected media ID from the remote computer.

Specifically, the imaging device 110 uses the network communication module 216 to communicate a request message 232 that includes information such as the detected media ID to a remote server such as the remote computer 112 of Fig. 1. Responsive to receiving the parameter request message from the imaging device 110, the remote computer 112 sends a response message 234 back to the imaging device. The response includes information such as a set of parameters that correspond to the detected media ID, an indication that the server is not able to provide corresponding parameters, and/or the like.

An exemplary procedure for an imaging device 110 to download media parameters is described in greater detail below in reference to Figs. 4 and 5.

#### **An Exemplary Server Computer**

Fig. 3 is a block diagram of an exemplary server computer 112 to serve media parameters to an imaging device. In particular, Fig. 3 illustrates further hardware and software aspects of the server computer. The computer includes a processor 310 that is coupled to a memory 312. The system memory includes any combination of volatile and non-volatile computer-readable media for reading and writing. Volatile computer-readable media includes, for example,

random access memory (RAM). Non-volatile computer-readable media includes, for example, read only memory (ROM), magnetic media such as a hard-disk, an optical disk drive, a floppy diskette, a flash memory card, a CD-ROM, and/or the like.

5 In a networked environment, application program modules 314 (or portions thereof) and/or data 320 (or portions thereof) that are depicted relative to the memory 312 may be stored in a remote memory storage device (not shown) that is operatively coupled to the computer 112.

10 The processor 310 is configured to fetch and execute computer program instructions from application programs 314 such as an operating system, a network communication module 316, and a remote look-up-table (RLUT) management module 318. The processor is also configured to fetch and store information from/to data 320 such as information from/to a RLUT 322, etc., while executing the application programs.

15 The communication module 316 is configured to use appropriate network protocols to receive request messages 232 and send response messages 234 respectively from/to the imaging device 110 of Figs. 1 and 2 across the network 114. In particular, the communication module is able to generate, communicate, and receive any one or more of the following types of  
20 data/messages: Web pages, electronic mail (e-mail), and/or other types of data packets such as Transmission Control Protocol (TCP)/Internet Protocol (IP)/User Datagram Protocol (UDP) data packets.

25 The RLUT includes one or more media IDs 324 that are mapped to respective media parameter 326. In this configuration, the RLUT 322 contains any number of media parameters 326 for various printing technologies. Such media parameters include, for example, a brand name, a media name, a media

type (e.g., paper, plastic, coated, etc.), size, thickness, weight, manufacturer, form (e.g., labels, checks, envelopes, etc.), color table, device compatibility, speed at which the media can be fed into a device, fusing temperatures, drying time, valid orientations, duplex options, temperature and humidity ranges, surface roughness, wicking, quantity/length, reorder address, and so on. In this configuration, these parameters are also categorized based on imaging device model type.

When there are differences in media parameters 326 between various imaging device 110 models, software versions, and/or the like, and if the request 232 from the imaging device provides an indication of its model or such other information, the RLUT management module 318 evaluates the RLUT 322 for a set of appropriate media parameters that correspond to the provided information. In this manner, the server 112 is better able to identify those parameters/portions of the RLUT to be downloaded to the requesting imaging device 110.

To illustrate this, consider that a laser printer 110 communicates a request message to the server that specifies not only the media ID of the media that is loaded into the printer, but also indicates other information such as the particular printer model, the particular software or version of the software being used by the printer, how the loaded print media is packaged (e.g., a ream or a roll), and/or the like. Responsive to receiving the request message, the RLUT management module 318 uses this additional information to more particularly customize its search of the RLUT 322 for a substantially optimal set of media parameters 326 to download to the laser printer.

Upon identifying a set of media parameters 326 that correspond to at least the imaging device detected media ID, the server 112 communicates the

identified parameters to the imaging device in a response message 234. Or, if no corresponding parameters are located, the response message includes an indication that corresponding parameters are not available from the server.

### **Exemplary Procedure**

Fig. 4 is a flowchart that shows an exemplary procedure 400 to download media parameters to an imaging device (i.e., the imaging device 110 of Figs. 1 and 2). At block 410, the imaging device detects a media identification indication (e.g., media ID 124 of Fig. 1). Block 410 is performed in response to a number of different criteria.

For example, block 410 is performed in response to recognition by the imaging device that a user has loaded a ream of print media into a tray or loaded a roll of print media onto a spool of the imaging device. In yet another configuration, block 410 is performed responsive to receiving by the imaging device a print, copy, or facsimile job that specifies a particular media. In this configuration, the imaging device identifies the respective media ID's in the media tray(s) and/or on the media roll(s) to determine whether the imaging device has access to the particular print media specified by the job. (If the media is not available, the imaging device can alert the user in some manner such as the communication of a message to indicate the unavailability of the media, the ordering of the specified media, and/or the like.

At block 412, the imaging device determines if a set of media parameters that correspond to the detected media ID (block 410) are locally available in a look-up-table such as the LUT 226 of Fig. 2. If they are available, the procedure continues at block 414, where the imaging device configures its operation based on the identified local media parameters (block 412).

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FOOTNOTES  
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If media parameters corresponding to the detected media ID (block 410) are not locally available (see, block 412), the procedure continues at block 416. At block 416, the imaging device communicates a media parameter request message (i.e., the request message 232 of Fig. 2) to a remote server such as the  
5 remote server computer 112 of Figs. 1 and 3. The parameter request message requests the server to download a set of media parameters that correspond to the detected media ID (block 410) to the imaging device.

At block 418, the remote server determines if it has access to a set of media parameters that correspond to the detected media ID (block 410). The  
10 server accomplishes this by evaluating a remote LUT (i.e. RLUT 322 of Fig. 2). At block 420, no matching media parameters having been identified (block 418); the server communicates an appropriate response to the imaging device, which indicates that no parameters were identified. At block 422, responsive to receiving the response of block 420, the imaging device  
15 configures its operating parameters based to a default set of media parameters.

At block 424, the server having identified a set of media parameters that correspond to the detected media ID (block 410), the server communicates an appropriate response to the imaging device, which includes at least a portion of the identified parameters. At block 426, the imaging device receives the  
20 response. At block 428, responsive to receiving the response from the server, the imaging device optionally updates a local look-up-table (i.e. LUT 226 of Fig. 1) with the received parameters.

At block 430, the imaging device configures its operating parameters based to the downloaded set of media parameters. In this manner, an imaging  
25 device, significantly, is now able to configure itself according to media

parameters that correspond to a new or otherwise unanticipated print media and determine a proper set of media parameters to use to print to the print media.

### **Conclusion**

5 Although the subject matter has been described in language specific to structural features and/or methodological operations, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or operations described. Rather, the specific features and operations are disclosed as preferred forms of implementing the claimed invention.

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